



Perchlorate

What is it and how will it effect *you*?

Properties of Perchlorate

- Powerful oxidizer in solid form
- Dissolution of solid perchlorate salts (NH_4^+ , Mg^{2+} , K^+ , Na^+) in water
- Inorganic anion (ClO_4^-)
- Very soluble and mobile in aqueous systems
- Resists reaction / long lasting in solution

Ammonium Perchlorate Oxidizer Component

- Primary ingredient in solid propellants:
 - ▼ rockets
 - ▼ missiles
 - ▼ fireworks
- Used in the manufacture of matches
- Air bag inflators

Solid rocket fuel with Ammonium Perchlorate has a short shelf life

- Periodically must be washed out of the country's missile and rocket inventory
- Large volumes have been disposed of since the 1940s
- Treated as hazardous waste (oxidizer)

Other uses of Perchlorate salts

- Aluminum refining
- Analytical chemistry reagents
- Manufacturing rubber, leather, paints, enamels, dyes
- Nuclear reactors
- Electronic tubes
- Additive for lubricating oils
- Medicine (treatment of hyper-thyroidism, Graves Disease)

Sources of contamination

- Leaks or spills from:
 - ▼ manufacturing sites
 - ▼ storage facilities
 - ▼ waste treatment plants
- Some types of fertilizer may contain perchlorate salts
- 43 states have perchlorate users or manufacturers

Health Effects of Perchlorate

Toxicological information is incomplete - studies focus on chronic low level exposure

- Potential suppression of thyroid function
 - ▼ Growth
 - ▼ Development
 - ▼ Metabolism
- Special concern about perchlorate 's influence on:
 - ▼ Developing fetuses
 - ▼ Infants

Environmental Effects of Perchlorate

Very little is known about perchlorate 's effect on the environment. Areas of concern include:

- Fate and transport
- Gross toxicity
- Dose response relationships
- Species in study group:
 - ▼ *Daphnia magna* - sediment invertebrate
 - ▼ *Lactuca sativa* (lettuce) - vascular plant
 - ▼ *Pimephales promelas* (Fathead minnow) - aquatic vertebrate
 - ▼ *Eisenia foetida* (earthworm) - soil invertebrate

Regulation of Perchlorate in Drinking Water

Unregulated Contaminant -
No EPA Maximum Contaminant Level (MCL)

Guidance and Action Levels for Various States

- Arizona: 31 ppb
 - ▼ Provisional Health Based Guidance Level (HBGL)
 - ▼ Advisory only - not enforceable
- California: Action level - 18 ppb
 - ▼ PWS must remove source from system, or provide notification
 - ▼ Monitoring required
- Nevada: Cleanup action level - 18 ppb
- Texas: "Interim" action level - 22 ppb

Nationwide Occurrence Data

New analytical technique introduced in April 1997 lowered detection level from 100 ppb to 4 ppb

- Found in water supplies of 15 million people in AZ, CA, NV
- Found in surface or groundwater in AR, IA, IN, KS, MD, NM, NY, PA, TX, UT, WV
- Las Vegas area groundwater contamination ranges up to 3,700,000 ppb
- Utah has reported groundwater contamination up to 200 ppb

Perchlorate & the CAP

May 1988 explosion at a rocket fuel plant in Henderson, NV released ammonium perchlorate into the Las Vegas Wash

- Wash drains into Lake Mead
- Perchlorate is in Lake Mead, the Colorado River downstream from Hoover Dam and the CAP canal

Arizona Occurrence Data

ADEQ Perchlorate report - Phase One
Cooperative effort with ASUA & ITCA

- Sampling began in April 1999
- Samples taken from:
 - ▼ Lake Mead
 - ▼ Colorado River
 - ▼ CAP canal
 - ▼ Groundwater wells
 - ▼ Other surface water sites
- City of Phoenix provided additional data

Results

- Value range:
 - ▼ High: 460 ppb at Lake Mead (NV) site
 - ▼ Low: No Detect (<4 ppb) at most sites
- Perchlorate is only found in Colorado River and CAP canal
- All Arizona sites sampled < 31 ppb (AZ's HBGL)
- No contamination detected in groundwater

Action Plan for Perchlorate Gather Information

- Monitor toxicology research
- Investigate treatment technologies
- ADEQ Perchlorate report-Phase Two
 - ▼ Planned for Spring 2000
 - ▼ Adds to occurrence database
 - ▼ May include MTBE occurrence data

Remediation of Perchlorate

Research is ongoing to evaluate the effectiveness of current technologies for treating and removing perchlorate from water

Conclusions for Perchlorate

Expect continued EPA investigation in the near future

- Revised toxicology information
 - ▼ Possible revisions to guidance levels
 - ▼ Possible MCLs
- Look for new treatment technologies
- Increased monitoring
- Increase in available information

Websites of Interest

- <http://www.adeq.state.az.us>
- <http://www.epa.gov/ogwdw/ccl/perchlor/perchlo.html>
- <http://www.hs.state.az.us/edc/ehpage.html>

Contact information

Brian Popadak
Arizona Department of Environmental Quality
3033 North Central Avenue
M0248A
Phoenix, AZ 85012
ph - 602/207-4511 fax - 602/207-4634
popadak.brian@ev.state.az.us
